

38. The chemical mechanical polishing device as claimed in claim 36, wherein the illuminated section is a dedicated measurement area.~~¶~~

IN THE ABSTRACT

At the end of the abstract, please add the following sentence: ~~¶~~ -The apparatus utilizes a bifurcated fiber optic cable to monitor changes on the surface of the thin film.~~¶~~

REMARKS

Claims 17-38 are pending. Claims 21-38 have been added. Support for the new claims is found in the following parts of the specification. No new matter has been added.

Claim 17 has been amended to recite "means for analyzing a light signal to determine thickness change and stopping thickness change when the thickness reaches a predetermined endpoint." Support for the change is found throughout the present specification.

New claim 21 is identical to claim 19 except that it specifies the basis of light signal analysis as interferometry or spectrophotometry as disclosed on page 7, line 16.

New claims 22, 26, 30, 34, and 38 are based on the disclosure at page 6, lines 16-20.

New claims 27 and 35 are based on the sentence bridging pages 10 and 11 of the disclosure.

New claims 23 and 28 are identical to original claim 19 except that they further specify illumination at the front (polished) and back (unpolished) sides of the substrate, respectively, based on the disclosure at page 7, lines 11-12 and 23-24.

New claims 24, 25, 29, 32, 33, and 37 have been added based on the disclosure at page 10, lines 18-23.

New claims 31 and 36 are identical to claim 19 except that they utilize an electrical slipring instead of a rotating coupler as disclosed on page 11, lines 22-25.

The minor informalities in the specification kindly noted by the Examiner have been corrected.

The abstract has been amended as suggested by the Examiner.

No new matter has been added.

In view of the foregoing amendments and the following remarks, favorable reconsideration of this application is courteously solicited.

Claims 17-20 have been rejected under 35 U.S.C. § 103 as obvious over Cleveland. Reconsideration of the rejection is respectfully requested.

A. Original Claims 17-18

Applicant maintains that Cleveland neither teaches nor suggests the apparatus of claims 17-18. Claim 17 recites that the apparatus includes "means for analyzing a light signal to determine thickness change and stopping thickness change when the thickness reaches a predetermined endpoint" (emphasis supplied). Cleveland neither teaches nor suggests any reason for including such means in his inspection apparatus.

The apparatus of Cleveland is directed to "inspection" of stationary articles (column 2, lines 10-13). Cleveland's apparatus uses a fiber-optic cable which can be rotated between inspections to facilitate loading of a new article. The apparatus in no way teaches or suggests means for analyzing a light signal "to determine thickness change and stopping thickness change when the thickness reaches a predetermined endpoint" as required by the presently claimed invention.

Accordingly, claims 17 and 18 are unobvious over Cleveland.

B. Original Claims 19-20

Claims 19 and 20 relate to an improvement in a "chemical mechanical polishing device." Cleveland is not even remotely related to the field of chemical mechanical polishing. Although Cleveland mentions that unspecified "articles" can be "inspected" for unspecified purposes, there is no teaching or suggestion to

utilize such an apparatus in a chemical mechanical polishing (CMP) machine. The rejection gives not one iota of motivation that would support such a combination.

As noted in the present specification, there would have been numerous potential obstacles faced by a skilled artisan that would have dissuaded one from even so much as attempting to apply fiber-optic technology in the field of CMP. Most notably, the fact that a CMP machine requires machinery that completely obscures the film on the substrate undergoing thickness change would have been a severe obstacle. In addition, potential interference at the polishing interface between the film on the substrate and the polishing surface of the CMP machine would have been thought to interfere with optical monitoring. For these reasons, one of ordinary skill in the art would not have been motivated to utilize Cleveland's device as a modification to a CMP machine.

Accordingly, claims 19 and 20 are unobvious over Cleveland.

C. New Claim 21

Claim 21, in addition to the reasons given above for claims 19 and 20, is further unobvious over Cleveland because it recites "means for analyzing a light signal based on interferometry or spectrophotometry." Cleveland only discloses the use of light for purposes of "inspecting" an "article." There is no suggestion to utilize interferometry or spectrophotometry to analyze the light signal of Cleveland. This is especially true given that the only working example of Cleveland relates to "inspection" of bases for lamps. It is not clear from the reference for what purpose the lamp bases are inspected, but it is clear that the inspection entails no use of interferometry or spectrophotometry. There would be no reason to utilize interferometry or spectrophotometry in the device of Cleveland because the articles being inspected are not undergoing "thickness change" (or any other change for that matter) as required by the presently claimed invention.

Accordingly, claim 21 is unobvious over Cleveland.

D. New Claims 23 And 28

Claims 23 and 28 are unobvious for the same reasons set forth above in section B.

E. New Claims 22, 26, 30, 34, and 38

These claims are unobvious for the reasons set forth in each section relating to the corresponding base claim. In addition, these claims are unobvious because they require that the "illuminated section" is a "dedicated measurement area." The use of a dedicated measurement area would not have been obvious based on Cleveland. Cleveland's device simply would have no use for a dedicated measurement area on a substrate of interest because there is no suggestion to monitor thickness with Cleveland's device. A dedicated measurement area would only be useful to one attempting to monitor thickness over time. By contrast, Cleveland seeks to perform an "inspection" on a "stationary article" which has already been produced. For example, there would have been no possible motivation for using a dedicated measurement area if one was inspecting lamp bases as taught by Cleveland.

The use of a dedicated measurement area, as explained on page 6, lines 18-20 of the present specification, is associated with a number of unsuggested advantages over the prior art. For example, it removes signal problems associated with the layer's topology, patterns, and multiple film layers. This advantage is neither taught nor suggested by Cleveland.

Accordingly, claims 22, 26, 30, 34, and 38 are unobvious over Cleveland.

F. New Claims 27 And 35

These claims recite that "the dedicated measurement area is illuminated at timed intervals." This feature is neither taught nor suggested by Cleveland.

Accordingly, claims 27 and 35 are unobvious over Cleveland.

G. New Claims 24, 25, 29, 32, 33, and 37

These claims recite the particular wavelength of light which is measured in the back side and front side embodiments of the present invention. Cleveland would not have enabled one of ordinary skill in the art nor motivated one to use these specific wavelengths, since Cleveland is only concerned with inspecting articles such as lamp bases as opposed to monitoring thickness change.

Accordingly, claims 24, 25, 29, 32, 33, and 37 are unobvious over Cleveland.

H. New Claims 31 and 36

These claims are patentable over Cleveland for the reasons set forth above in section B. In addition, these claims require the use of an electrical slipring instead of a rotating coupler, a feature which is clearly not taught or suggested by Cleveland.

Accordingly, claims 31 and 36 are unobvious over Cleveland.

I. Conclusion

In conclusion, it is believed that all claims pending in the application are patentable over Cleveland. The device of Cleveland is structurally unsuitable for use in measuring thickness change. Cleveland would not have provided the motivation for, nor enabled one of ordinary skill in the art to adapt such a fiber-optic device for use in monitoring thickness change in CMP.

Accordingly, withdrawal of the rejection based on Cleveland is requested.

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In view of the above amendments and remarks, favorable reconsideration and allowance of this application are requested. In the event that any issues remain, the Examiner is invited to telephone the office of the undersigned if it would expedite prosecution.

Respectfully submitted,

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Date



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